

Integration of multi-scale BIM and AI for Railway Asset Management towards Net Zero

Sresakoolchai, Jessada; Kaewunruen, Sakdirat

License:
Creative Commons: Attribution (CC BY)

Citation for published version (Harvard):
Sresakoolchai, J & Kaewunruen, S 2023, 'Integration of multi-scale BIM and AI for Railway Asset Management towards Net Zero', Clarke Lecture 2023, Birmingham, United Kingdom, 22/06/23 - 22/06/23.

[Link to publication on Research at Birmingham portal](#)

General rights

Unless a licence is specified above, all rights (including copyright and moral rights) in this document are retained by the authors and/or the copyright holders. The express permission of the copyright holder must be obtained for any use of this material other than for purposes permitted by law.

- Users may freely distribute the URL that is used to identify this publication.
- Users may download and/or print one copy of the publication from the University of Birmingham research portal for the purpose of private study or non-commercial research.
- User may use extracts from the document in line with the concept of 'fair dealing' under the Copyright, Designs and Patents Act 1988 (?)
- Users may not further distribute the material nor use it for the purposes of commercial gain.

Where a licence is displayed above, please note the terms and conditions of the licence govern your use of this document.

When citing, please reference the published version.

Take down policy

While the University of Birmingham exercises care and attention in making items available there are rare occasions when an item has been uploaded in error or has been deemed to be commercially or otherwise sensitive.

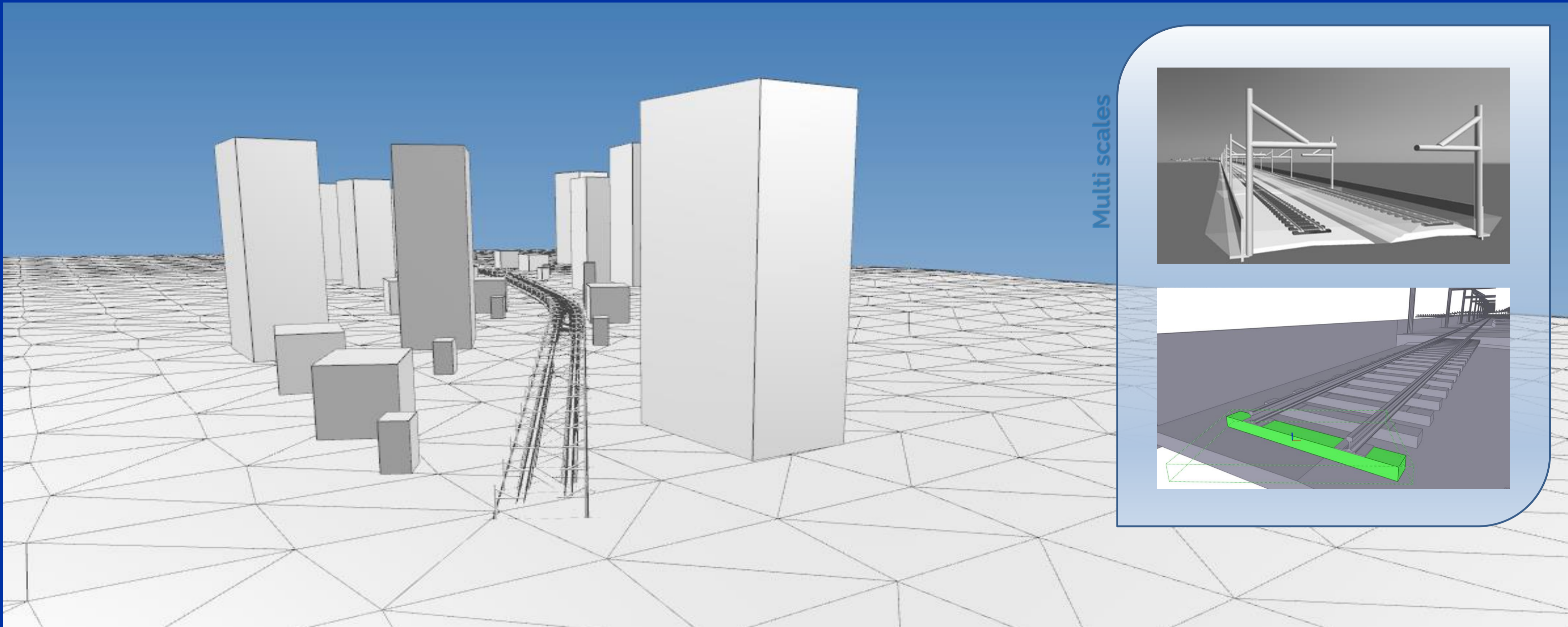
If you believe that this is the case for this document, please contact UBIRA@lists.bham.ac.uk providing details and we will remove access to the work immediately and investigate.

Integration of multi-scale BIM and AI for Railway Asset Management towards Net Zero

Jessada Sresakoolchai, Dr Sakdirat Kaewunruen, School of Engineering



UNIVERSITY OF BIRMINGHAM



OBJECTIVE

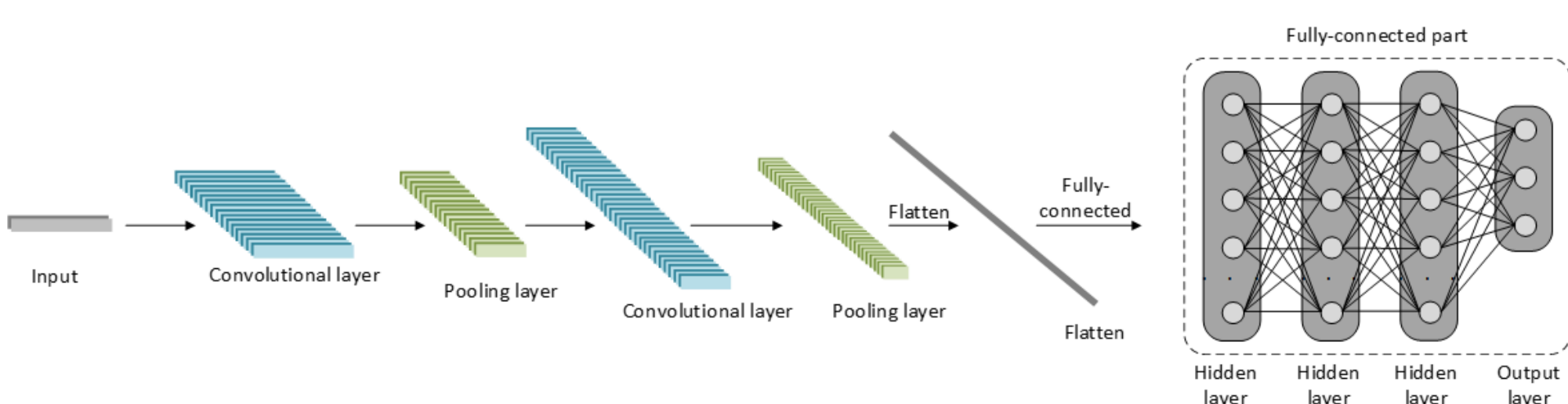
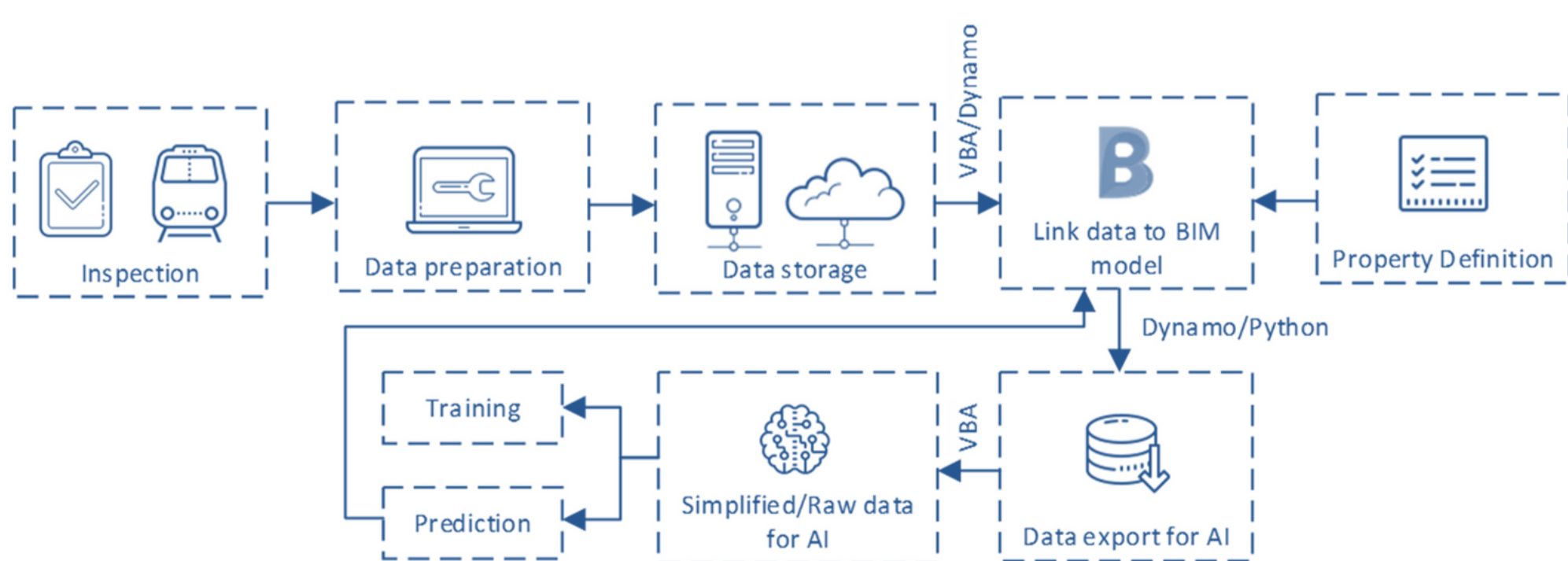
To integrate and co-simulate BIM and AI for railway asset management by create a systems approach to integrate them together and utilize for the whole life project

BACKGROUND

The demand of railway transportation is souring but railway asset management technologies are insufficient. Every phase of railway lifecycle is critical. Therefore, a new tool capable of whole-life asset management is necessary to improve overall efficiency of railway systems towards net zero emission.

METHODOLOGY

- BIM and AI model development
- BIM and AI integration using real-world data processing
- Multi-scale BIM co-simulations for cross functional analyses
- Technical robustness assurance for AI
- Novel AI models for fulfilling multi-purposes of AI models



An example of CNN model

RESULTS

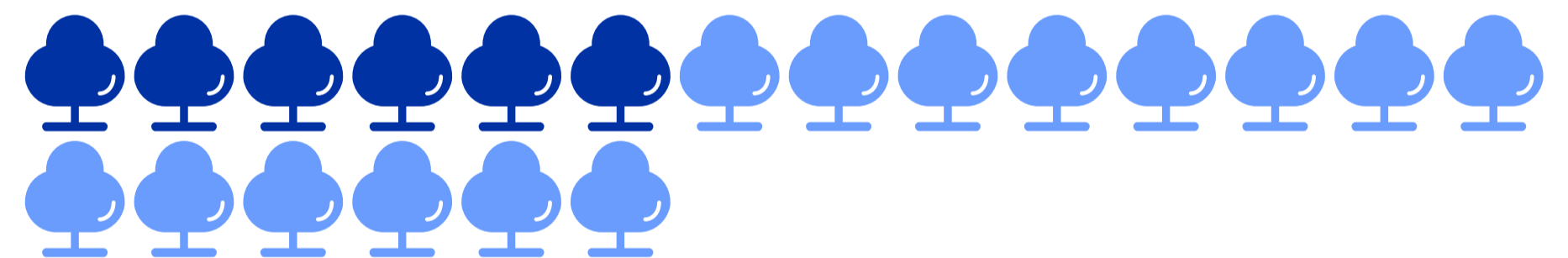
MAINTENANCE COSTS **(reduced by 68%)**



MAINTENANCE ACTIVITIES **(reduced by 61%)**



CARBON EMISSIONS **(reduced by 65%)**



FINDINGS

- Developed approaches improve intelligent asset management
- Performances & robustness of AI models are satisfying
- Insights are discovered
- Asset management are optimized towards net zero
- Data-driven approach can be achieved

CONCLUSION

- Integration of BIM and AI can improve the asset management
- Data management is key
- Decision making is supported
- This is the world's first integration of BIM and AI for rail asset management

KEY PUBLICATIONS

- Sresakoolchai, J., & Kaewunruen, S. (2021). Integration of building information modeling (BIM) and artificial intelligence (AI) to detect combined defects of infrastructure in the railway system. In Resilient Infrastructure: Select Proceedings of VCDRR 2021 (pp. 377-386). Singapore: Springer Singapore.
- Sresakoolchai, J., & Kaewunruen, S. (2021). Integration of building information modeling and machine learning for railway defect localization. IEEE Access, 9, 166039-166047.
- Sresakoolchai, J., Hamarat, M. and Kaewunruen, S., 2023. Automated machine learning recognition to diagnose flood resilience of railway switches and crossings. Scientific reports, 13(1), p.2106.
- Sresakoolchai, J. and Kaewunruen, S., 2022. Prognostics of unsupported railway sleepers and their severity diagnostics using machine learning. Scientific reports, 12(1), pp.1-10.



jss814@student.bham.ac.uk
s.kaewunruen@bham.ac.uk

